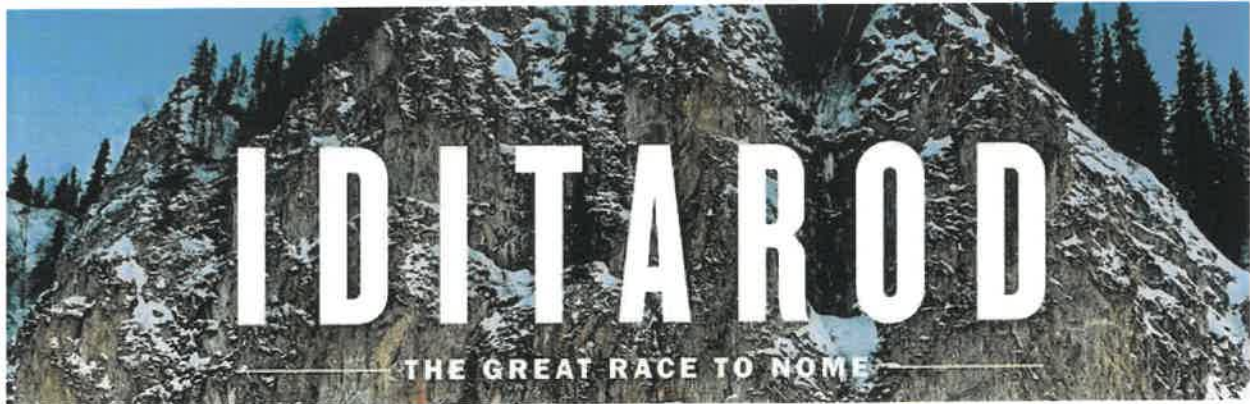


LESSON TITLE:	3D Sled Designs
BACKGROUND INFORMATION:	
CREATED BY:	Kelly Searson and Chelsea Junkins
GRADE LEVEL/ SUBJECT:	This lesson could be adapted to any level grade 5 and above. Technology and Writing
LEARNING OBJECTIVES/ ESSENTIAL QUESTIONS:	What elements are needed to make a functional sled pulled by the Sphero robots? Students research the basic elements of a sled to design and 3D print a sled that will be evaluated on its ability to carry a load (Oreo cookie) while competing in a timed race around an established track.
STANDARDS ADDRESSED:	<p><u>WRITING STANDARDS</u></p> <p>W.6.1 - Write arguments to support claims with clear reasons and relevant evidence.</p> <p>W.6.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>W.6.6 Use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others.</p> <p>W.6.7 - Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.</p> <p><u>TECHNOLOGY STANDARDS</u></p> <p>6-8.DT.1.c. Define and categorize the requirements of a design as either criteria or constraints.</p> <p>6-8.DT.1.f. Give examples of how trade-offs must occur when optimizing a design in order to maintain design requirements</p> <p>Topic 4: Evaluate designs using functional, aesthetic and creative elements.</p> <p>6-8.DT.4.c. Apply the design principle "form follows function" to develop a product.</p>
MATERIALS NEEDED:	Computer, TinkerCad program, 3D printer. Other materials may be needed to tweak printed project. These materials may include tape, hot glue, super glue, paper, cardboard, pliers, or items that provide additional weight to the rear of the sled.
PROCEDURE:	
ENGAGEMENT:	Show videos or photos of dogsleds that illustrate the essential parts needed to carry a load smoothly. Working individually or in partners, allow a few minutes to pencil

	sketch a basic design.
LESSON:	<p>Using TinkerCad, design a 3D prototype of the sketched design, making changes where needed to accommodate the diameter of the Sphero and the cargo (Oreo). Basic research on what makes an object glide over a smooth surface (a sled over snow) will be helpful in this design.</p> <p>At the completion of their design, students will send the file to the tech coordinator who will slice and send to the 3D printer. Once printed, supports must be removed and cleaned. Problem solving is an important step at this point if designs did not print as thought. (Tape harness might need to be added to keep the Sphero from "jumping" out of the sled, etc.)</p> <p>Students will be required to write a full description of their sled, noting and explaining aspects of the design that they believe will make their sleds superior to others. These aspects should include those for which research proves to promote speed and control. Include a bibliography.</p>
CONCLUSION:	<p>Once all sleds have been printed, a parade of sleds will showcase all. Designs will be critiqued prior to racing.</p> <p>Let the races begin! Heats of 2 sleds will be raced in a single elimination bracket.</p>
ASSESSMENT:	<p>Description writing with bibliography.</p> <p>Rubric for sled design is attached.</p>
NOTES:	
ENRICHMENT/ REINFORCEMENT SUGGESTIONS:	<p>Winners of the races will receive prizes at our WG Musers' Banquet following the conclusion of the Iditarod.</p> <p>During down time, students were allowed to design a winner's trophy. Each class winner picks the best design. This trophy will be 3D printed and awarded to the winner.</p> <p>Writing assignment - If you were allowed to design your sled again, what specific changes would you make to better your original design?</p>
OTHER:	<p>** The original track was simply an oval taped out on the floor. It was impossible to keep racers from cutting the corners. Subsequent races were held around a solid barrier made out of wood. There is no outer barrier, just an infield that can not be driven across.</p>



DOG SLED STEM

Students,

You are going to 3D design a dog sled prototype using TinkerCad. It is your job as the lead engineer to design a sled that is *fast* and *functional*. The sled that stays upright, attached to the dog sled team (Sphero Robot), carries the load successfully, and crosses the finish line first is the winner. Good luck!

	21-30 Excellent	11-20 Satisfactory	1-10 Poor
Includes essential parts of the dog sled (basket, runners, etc.). Resembles dog sleds used in the Iditarod.			
Design is functional; attaches easily to the team of dogs (Sphero Robot). Less than 10 in x 10 inch design.			
Concept is original and shows effort.			
Total			
<i>Bonus points awarded to winners of heats and the final race</i>			

